

Herculaneum Focus Meeting #2
November 20, 2002

Comments/Insights On Site-Specific Data and Documents Distributed
At October 23, 2002 Herculaneum Focus Meeting # 1

Data Results 1: Interior Recontamination Sampling Results, 16 Pages:

Interior dust lead data from wipes and carpet vacuum sampling are presented for a total of 17 homes. Data from 1 to 5 post-cleanup time periods are available. The average carpet lead concentrations from the houses by the HEPA vacuum method was 1284 mg/kg with a range by house from 369 to 3722. Loading values from the HEPA vacuum averaged 5.33 mg/sq ft with a range by house of 0.38 to 35.9. Loading values from wipe samples collected from the same carpet as were vacuum sampled are available for four of the homes (averages ranged from 6.76 to 33.7 ug/sq ft). For homes between 0.25 and 0.45 miles of the smelter, the average carpet lead loadings from vacuuming averaged 13.1 mg/sq ft while the averages for houses farther away tended to be lower. There appears to be a relationship between carpet HEPA vacuum dust lead loading and distance from smelter with a marked decrease in homes greater than one half mile from the smelter. Wipe and HEPA lead loadings are strongly correlated although the sample size is relatively small (13).

Comments:

The results of the carpet cleaning efforts are similar to those reported in the Ewers et al paper that has been provided, where the difficulty in cleaning carpets was demonstrated. For all 13 houses with an initial HEPA vacuuming and at least one later vacuuming, average loadings and concentrations were higher for the later HEPA vacuuming. These data suggest that consideration be given to replacing some of the carpets.

For all 13 Nine of the 17 houses examined had one or more floor dust wipe samples collected during the first or later Recontamination sampling phases that exceeded the current EPA health-based standard. Ten of the houses had at least one window sill dust wipe sample collected during a Recontamination sampling phase that exceeded the EPA standard; six houses had both window sill and floor samples exceeding the limit. These data suggest that the soil removal and replacement at the house and the household cleaning program were generally not sufficient to maintain dust lead levels below EPA health-based standard.

Data Results 2: Exterior Recontamination Sampling Results, Five Pages



Soil and gravel driveway lead data are presented for 21 houses and one easement. Data from four quadrants of the soil area and from gravel driveways are presented. For some (random 10%) samples the sample was also analyzed in the laboratory for confirmation. Data were not presented on soil lead concentrations prior to soil excavation and replacement [These data were later made available].

Comments:

There does not appear to be any evidence of increasing soil lead levels during the first year since soil replacement. The prediction of AA results from field portable XRF results has a degree of uncertainty associated with it. Referring to the Clark et al 1999 paper, for the copper smelter area unsieved soil samples an XRF result of 400 could represent AA results as high as 536 using the 95% confidence interval. In order to be 95% certain that the AA value was less than 400 ppm, the XRF value (from the Polish data) would have to be no higher than 193. Using this criterion, 13 of the 23 properties in Data Results 2 could have had at least one area (quad or driveway) where the lead level could have been 400 ppm or greater compared to only 4 of the properties using a direct conversion from XRF to AA. It would be useful to compare laboratory (AA) and XRF data available from Herculanum.

Data Results 3: Street Sampling Results- Primary Haul Routes, Six Pages

Data are presented for samples collected over about a one-year period from 11 sampling locations; for many of the samples sampling locations were on opposite sides of the same street. Beginning 2/5/2002 a HEPA vacuum was used to collect the sample. [We were informed that prior to that time a dust buster device was used; this method was discontinued because it was producing inconsistent results and did not pick up many of the smaller particles].

Comments

A cursory look at the data does not suggest a trend in levels, mg/kg or mg/sq ft, over time. Although there was only about a ten-fold variation in loading at an individual sampling site, concentrations varied by up to two orders of magnitude. Maximum concentrations at sampling sites varied only somewhat; ranging from 37,000 ppm to 93,000, 3.7% to 9.3% lead. The median values for the 11 stations sampled ranged from 8100 to 40,000 mg/Kg and 0.77 to 8.72 mg/sq ft. These levels are higher in concentration than those reported for Trail, B.C. which were

an average of 1123 mg/Kg before the new smelter was built and 888 afterwards, but were somewhat lower in loading (Trail, BC. about 20 and 11, respectively.) Street dust lead levels in the HUD Evaluation were generally lower in concentration (geometric mean 431 mg/Kg) and similar in loading (geometric mean 1.58 mg/sq ft). It would be useful to have a description of the vacuum cleaner equipment used, the rationale for its selection and the protocol for its operation.

Data Results 4: Street Sampling Results- Secondary Haul Routes, Six Pages

Data are presented for samples collected over about a one-year period from 12 sampling locations.

Comments

Overall, concentrations and loadings appear to be lower than along primary haul routes but there is a considerable overlap in the ranges of values. Median values by sampling station ranged from 8,100 to 40,000 mg/Kg (median 16,000) and 0.77 to 2.38 mg/sq ft (median 2.38). Since a widely recognized standard method for collecting street dust is not available, the method used here should be documented. It would also be useful to compare this method with that used in the sampling of housing areas in the HUD Evaluation. Because of the considerable overlap in concentrations and loadings for the primary and secondary haulage routes, it would be useful to extend the sampling to other roads and alleys and to areas on the housing sites (driveways, sidewalks etc). Unpaved areas should be included and, if results warrant, consideration may need to be given to paving.

Data Results 5: Missouri Department of Natural Resources Third Quarter Lead Ambient Air Quality Monitoring Results, Three Pages

Data from the third quarter of 2002 are presented for seven monitoring stations. Three stations had exceedances of the 1.5 ug/cu.m standard: #1 Dunkin on 12 Aug (1.89) and 21 Aug (1.53); #2 Dunkin on 12 Aug (1.79) and 21 Aug (1.51) and H. Broad Street on a number of days. [The August 2002 Update Number 3, Herculaneum Lead Smelter Site, Lead Removal public information document stated that during the second quarter Doe Run "continued to implement measures to reduce air emissions from the smelter facility including removing stockpiled wastes, enclosing the blast furnace and enclosing the fume handling processes"].

Comment:

Although we did not review plans for emission reductions at the smelter facility, the measures are said to be having the desired result of reducing air lead values.

Document 1: Bibliography for Lead Dust Contamination Research, Four Pages

Contains many references to lead dust contamination research, some of which were provided by Sterling and Clark.

Comment

To assist in the retrieval of individual references complete citations should be provided (journal citation data, publisher etc).

Document 2: Bioavailability of Lead in Test Materials, 72 Pages

The relative bioavailability of two composite samples from Herculaneum was determined using an established protocol involving young swine. Each composite sample was said to be made up from 12 top one-inch soil samples. Test material #2 was found to be an estimated 71% as available as the lead in lead acetate. Data for material #1 appear to have been removed from the report.

Comment

It would be useful to see the results from material #1. Was consideration given to using dust collected from inside the homes of children with elevated blood lead?

Document 3: Interior Dust Clean Up Plan, 36 Pages

The protocol for the clean-up procedure and its documentation is presented.

Comments

It may be useful to consider adding a section in the front discussing the purpose of the plan from the resident's point of view and to emphasize the importance of developing a level of trust between the cleaning crew and the residents. This could result in a document explaining the plan and its purpose to the residents. Would it be possible to hire some local individuals to become involved in the cleaning, even if it was to be in the form of a liaison between the cleaners and residents? It should be stressed that the cleaning crews are operating in other people's private homes and that they should treat as confidential any observations etc. They are not to share this information with others. At the October 23, 2002 meeting, the use of a video camera to assist in verifying damages that might occur to contents of the homes was mentioned but does not appear to be in this document. If such a procedure is used, its purpose should be explained to the residents' satisfaction. Appendix D of the document, the

Quality Assurance Project Plan (QAPP) makes reference on page 8 to "EPA Region 7 SOP # 4231.707A" for use of field portable XRF for soil lead sample screening; it would be useful to have a copy of this procedure. The next paragraph indicates that dust wipe samples may be analyzed by XRF also; it would also be useful to have the procedure for the XRF analysis of dust wipe samples. Because of the uncertainty in predicting laboratory values from XRF values (mentioned earlier in a discussion of references supplied by Sterling/Clark), a lower XRF level than the standard needs to be used to be 95% certain of the sample not having a value exceeding the standard.

Document 4: Lead Speciation Studies of Herculaneum Soils and Household Dusts, 22 Pages

Results from one method for attempting to determine originating source of lead in household dust are reported. This method analyses the elemental species content and associations from sample sites that may act as attributing sources and compares those results through a modeling method with the elemental species content in household dust. Source materials identified and evaluated were slag, road dust, concentrate (smelted material?), and paint. Overall findings indicated that the originating sources of lead in household dust derive from approximately 50-60% road dust, 20-30% soil, < 5% paint, and ≤ 10% concentrate (particles that are mostly lead and not associated with other identifying elements). Attic dusts appear to derive almost completely (95-100%) from road dust. Slag itself is considered a minor to non-existing source problem. A large amount of the lead was found in the particle size distribution < 1.8 µm.

Comments

Appendix I and II that describes the specific analytical procedures and modeling criteria is not part of this package for review. Information concerning collection of samples for analysis is not available or commented on. This method of source apportionment using elemental comparison of particles has been performed with acceptable results for over twenty years. Other methods are also available, such as isotope analysis. The source of lead in household dust is clearly demonstrated to derive from non-paint outside sources. Road dust appears to be the primary source. Much of the lead is found in small particles (< 1.8 µm), which is important in regards to re-suspension and transport, and for hand-to-mouth activities resulting in ingestion. In addition, a large percentage of these particles are found in the concentrate material (high lead content).

Summary

Conclusions and Recommendations from Site-Specific Data

Carpet Cleaning The apparent difficulty in cleaning carpets suggests that it may be more economical to consider replacing some of the carpets.

House Cleaning Since more than one-half of the homes had one or more floor dust wipe samples collected after cleaning that exceeded the current EPA health-based standard and more than one-half had at least one window sill dust wipe sample that exceeded the EPA standard, the current cleaning protocol does not appear to be satisfactory for these houses at this time. This may be due to deficiencies in the protocol, contamination from neighboring house areas that have not received either soil abatement or house clean up, or continued contamination from the smelter operations or some combination of these factors. Participation in the house-cleaning program might be increased if the protocol was expanded with an addition designed to make it more "resident friendly". As written now it appears to address needs of the cleaning crew. The purpose of the addition to the protocol would be to increase the level of understanding and trust between the cleaning crew and the residents. Consideration could be given to the hiring of some local individuals to become involved in the cleaning, perhaps as liaison between the cleaners and residents. If a document describing how residents could use HEPA vacuum cleaners and other methods to reduce lead exposures is not already available, consideration might be given to preparing such a document.

Street Cleaning A brief examination of data from the street cleaning does not suggest a trend in levels, mg/kg or mg/sq ft, over time. Therefore it appears that the street cleaning procedure should be continued and perhaps expanded to include all paved areas. Cleaning frequency could be adjusted depending on the results of street dust sampling.

Data and Information Gaps

Data were not available to us at the time of the preparation of these comments on blood lead of children and XRF paint lead levels in the housing tested. Results from the bioavailability testing of "material #1" were also not available to us.

The prediction of AA results from field portable XRF results has a degree of uncertainty associated with it for both soil and dust wipe sample analysis. It is not clear whether this uncertainty is included in the protocols for the use of the field portable XRF.

Since a widely recognized standard method for collecting street dust is not available, the method used here should be documented. It would also be useful to compare this method with that used in the sampling of housing areas in the HUD Evaluation.

To assist in the retrieval of individual references contained in the bibliography, more complete citations should be provided (journal citation data, publisher etc).

Similarity of Site-Specific Data and That from Other Sites

The active lead smelter community of Trail, British Columbia has a number of similarities to Herculaneum. [Similarities in dust lead levels between Herculaneum and a number of other cites is mentioned in comments in the annotated references document].

Carpet cleaning The results of the carpet cleaning efforts are similar to those reported in the Ewers et al (1994) paper that has been provided, where the difficulty in cleaning carpets was also demonstrated.

Street Dust Lead Cleaning Consideration should be given to extending the street cleaning operation to other public and private areas. Examination of the street dust lead by distance from the smelter and a quantitative measure of haulage may be useful.